

Project C-5: Hydrogen storage in carbon-based materials

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Progress during 2003

1. QinetiQ have developed a process for making and characterising highly graphitic carbon nanostacks, similar to those reported by Baker and Rodriguez. The specific surface area of these nanostacks is $60\text{m}^2\text{g}^{-1}$ as determined by BET measurements in N_2 . At room temperature, these should physisorb no more than 0.05wt% H_2 , assuming the same sites are available to both N_2 and H_2 .
2. A temperature controlled Sievert adsorption/desorption system has been built and commissioned together with a temperature programmed desorption system linked to a mass spectrometer.
3. Preliminary adsorption results, on 0.5g lots of material, has shown 3-4wt% adsorption of hydrogen. Material taken from the Sievert equipment and rapidly transferred to the thermal desorption apparatus has shown a prominent H_2 desorption peak at $\sim 100^\circ\text{C}$ when heated from liquid N_2 temperature up to 300°C . It is estimated that the desorption peak corresponds to 0.4 — 0.8wt% H_2 left in the nanostacks.
4. QinetiQ regard the results as preliminary. A careful review of the experimental procedures is underway. Additionally, the Sievert equipment has been modified to enable adsorption measurements to be carried out with both high pressure He and H_2 . The rationale is that, if physisorption is the only process taking place, adsorption of He and H_2 will be similar, and small. If there is an abnormal chemisorption process occurring with H_2 , as implied by adsorption of over 1wt% at room temperature, then significant differences should be found.